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"Rocker Bogie" Saprem Tharkude[1], Shivnath Kolekar[2], Mintu Kumar Yadav[3], Nilesh Yadav[4], Wasim Shaikh[5]

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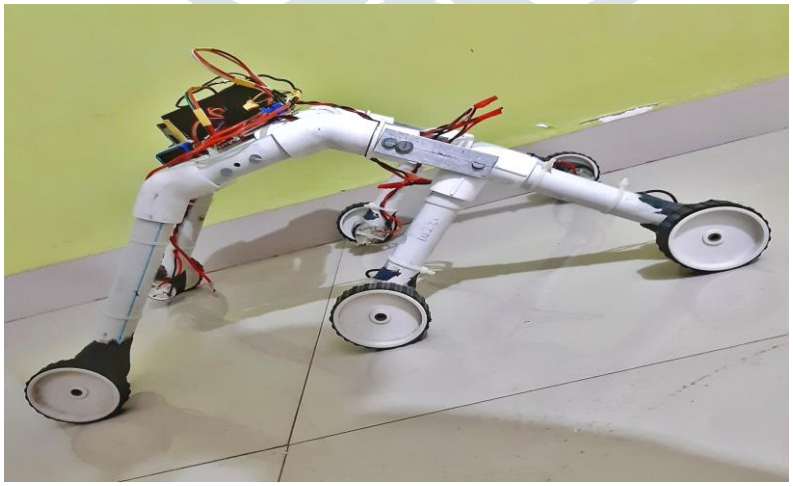
Abstract : **The need to developed a highly stable suspension system capableof operating in multi terrain surface while keeping all wheels in contact with the ground. To design a mechanism that can traverse terrains where the left and right rockers individually climb different obstacles. To sustain a *tilt of over 50degree withouttipping over the sideways.***

1. INTRODUCTION

The rocker bogie system is the suspension arrangement used in the mars rover (mechanical robot) introducedforthemarspathfinderandalsousedontheMarsExplorationRover(MER)&MarsScience Laboratory (MSL) missions. It is currently NASA's favored design.

The term "ROCKER" comes from rocking aspects of the larger links on each side of the suspension system. These rockers are connected to each other side of suspension system. These rockers are connected to each other and the vehicle chassis through a differential. Relative to chassis, when one rocker goes up, andother goes down. The chassismaintains the average pitchof angle of both rockers. One end of the rocker is fitted with a drive wheel and the other end is pivoted to a bogie.

The term "BOGIE" is refers to a links to that have a drive wheel at each end of bogies were commonly used as load wheels in the track of army tanks as idlers distribution the load over the terrain. Bogie is also quite commonly used on the trailers of semi terrain trucks. Both applications now prefer trailing arm suspension.



2. WORKING OF MECHANISM

In order to go over an obstacle, the front wheels are forced against the obstacle by the rear wheels. The rotation of the front wheel then lifts the front of the vehicle up and over the obstacle.

The middle wheel is the pressed against the obstacle by the rear wheel and pulled against the obstacle by the front, until it is lifted up and over.

Finally, the rear wheel is pulled over the obstacle by front two wheels. During each wheel's traversal of the obstacle, forward progress of the vehicle is slowed or completely halted.

These rovers move slowly and climb over the obstacles by having wheels lift each piece of the suspension over the obstacle one portion at a time.

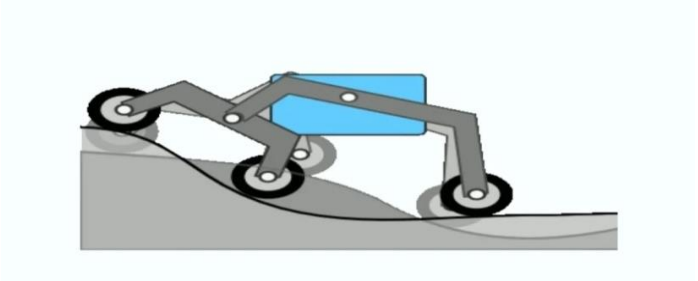


Fig. Rocker Bogie Mechanism

3. METHODOLOGY

As per the research it is find that the rocker bogie system reduces the motion by half compared to other suspension systems because each of the bogie's six wheels has an independent mechanism for motion and in which the two front and two rear wheels have individual steering systems which allow the vehicle to turn in place as 0 degree turning ratio. Every wheel also has thick cleats which provides grip for climbing in soft sand and scrambling over rocks with ease.

In order to overcome vertical obstacle faces, the front wheels are forced against the obstacle by the centre and rear wheels which generate maximum required torque. The rotation of the front wheel then lifts the front of the vehicle up and over the obstacle and obstacle overtaken. Those wheels which remain in the middle, is then pressed against the obstacle by the rear wheels and pulled against the obstacle by the front till the time it is lifted up and over. At last, the rear wheel is pulled over the obstacle by the front two wheels due to applying pull force. During each wheel's traversal of the obstacle, forward progress of the vehicle is slowed or completely halted which finally maintain vehicles centre of gravity. The above said methodology is being practically proved by implementing it on eight wheel drive ATV system in order to gain maximum advantage by rocker bogie system.

4.DESIGN AND SELECTION OF WHEEL

Design of wheel is required at velocity up to 0.5 m/s. Assume speed is 60 -100 rpm motor. Using velocity relation velocity is calculated for assumed speed. Using calculated velocity value need to find out diameter of wheel is 95.35 mm. Hence we selectthe wheel of 100 mm diameter (standard wheel). Selection of rubber thread bonded to the wheel makes it light weight and durable, provides excellent traction, friction. These plastic wheels offer a low cost solution that is durable enough for a combat robot yet still light enough to be practical.
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Wheel Diameter: 100 mm Design & Selection of Wheel:
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Wheel Diameter: 100 mm

3. Literature Review

The concept of our research work is to create a rocker bogie drive system based on those of NASA. NASA developed the rocker-bogie suspensionsystem for their rovers and was implemented in the Mars Pathfinder's and Sojourner rover. The rocker-bogie suspension system passively keeps all six wheels on the robot in contact with the ground even on uneven surfaces. This creates for great traction and maneuverability (Harrington & Voorhees). The rocker-bogie suspension mechanism which was currently NASA's approved design for wheeled mobile robots, mainly because it had study or resilient capabilities to deal with obstacles.

The researchers discuss theconcept and parameter design of a Robust Stair Climbing Compliant Modular Robot, capable of tackling stairs with overhangs. Modifying the geometry of the periphery of the wheels of our robot helps in tackling overhangs. Along with establishing a concept design, robust design parameters were set to minimize performance variation Literature Review

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4. ADVANTAGES

- This mechanism allows climbing obstacles twice the size of wheel diameter.□Does not employ springs and stub axles.
- Equal distribution of load on all wheels.
- Independent movement of rocker on either sides of the bogie.
- The front and back wheels have individual drives for climbing.
- The design is simple and reliable.

5. Conclusion

This project will try to reaching nearly all of over design requirement, and in many exceeding original design goals. Furthermore, all components, mechanical and electrical will be thoroughly tested as a complete system in real world field testing conditions to validate their success. Overall preliminary estimates for the general scope, budget, and timeline, for the project will be closely followed with the exception if the project goes moderately over budget.

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7. REFERENCES

[1] P. Panigrahi, A. Barik, Rajneesh R. & R. K. Sahu, "Introduction of Mechanical Gear Type Steering Mechanism to Rocker Bogie", Imperial Journal of Interdisciplinary Research (IJIR) Vol-2, Issue-5.
[2] A. Bhole, S. H. Turlapati, Raja shekhar V. S, J. Dixit, S. V. Shah, Madhava Krishna K, "Design of a Robust Stair Climbing Compliant Modular Robot to Tackle Overhang on Stairs".
[3] M. D.Manik, A. S. Chauhan, S. Chakraborty, V. R. Tiwari, "Experimental Analysis of climbing stairs with the rocker-bogie mechanism", Vol-2 Issue-2 Ph.No. 957-960 IJARIIE ISSN (O)-2395-4396, 2016.
[4] B. D. Harrington and C. Voorhees, "The Challenges of Design in the Rocker-Bogie Suspension for the Mars Exploration Rover", Proceedings of the 37th Aerospace Mechanisms Symposium, Johnson Space Center, page No. 185-198.